

REMARKS

Amendments to the Drawings

As suggested in the Office action, Applicants herein amend Figure 4B to include a dashed box to indicate the elements of the transistor and a dashed box to indicate the elements of the capacitor. The amendment is supported, for example, by Figure 4B as filed, and by page 20, lines 11-23 of the Specification. Accordingly, Applicants submit no new matter is introduced by the drawings amendments.

Amendments to the Claims

Claims 1-20 were filed with the original application. Applicants hereby cancel claims 2, 13, 14, 17, 19 and 20, and amend claims 1, 3, 5, 6, 7, 9-12, 15, 16 and 18. Upon entry of these amendments, claims 1, 3-12, 15, 16 and 18 are presented for examination.

Claims 1, 3, 5, 6, 7, 9-12, 15, 16 and 18 are amended to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Independent claim 1 is amended to clarify that a transistor includes a layer of insulating material of the transistor between a first layer of conductive material of the transistor and a second layer of conductive material of the transistor, and that a storage capacitor includes a layer of insulating material of the storage capacitor between a first layer of conductive material of the storage capacitor and a second layer of conductive material of the storage capacitor. Claim 1 is further amended to clarify that a transistor includes a data line, and to incorporate features from original claim 2.

Claims 3 and 5 are amended to clarify that one of the layers of the transistor and a respective one of the layers of the storage capacitor can be the same continuous layer. Claim 6 is amended to clarify that a layer of semiconducting material can be unpatterned. Claim 7 is amended to clarify that a first gate line can be in communication with the gate electrode for addressing the display medium. Claim 9 is amended to clarify that the second layer of conductive material of the storage capacitor can form a storage capacitor pixel electrode, and the first layer of conductive material of the storage capacitor can form a storage capacitor gate electrode.

Claim 10 is amended to clarify that the layer of insulating material of the storage capacitor can be patterned. Claim 11 is amended to clarify that the layer of insulating material of the storage capacitor can be unpatterned. Claim 12 is amended to clarify that the layer of insulating material of the storage capacitor and the layer of insulating material of the transistor can be the same layer.

Claims 15, 16 and 18 are amended to clarify that a pixel includes a portion of the display medium. This clarification restates the originally claimed feature of a display medium including a plurality of pixels.

Support for the claim amendments may be found throughout the specification and claims as originally filed (see, e.g., page 2, lines 2-19, page 9, lines 2-4 and 9-13, Figures 1, 2A, 2B, 2C, 2D, 4A, 4B, 6A and 6B, and original claim 2). Accordingly, Applicants submit no new matter is introduced by the above amendments.

Objections to the Information Disclosure Statement

The information disclosure statement filed on July 26, 2001 is objected to under 37 C.F.R. 1.98(a)(2) as allegedly failing to provide a legible copy of each cited reference. During a telephone conversation on October 30, 2002, the Examiner indicated that copies of the references are missing from the application file. Applicants agreed to prepare and submit a new set of copies of the references so that the cited references will be considered.

Objections to the Drawings

The drawings are objected to under 37 C.F.R. 1.84(a) as allegedly failing to show every feature of the invention specified in claims 1, 5, 6, 9-11, 13, 14 and 18-20. In view of the cancellation of claims 13, 14, 19 and 20, and the amendments to claims 1, 5, 6, 9-11 and 18, Applicants respectfully submit that the drawings now show every feature of the invention specified in claims 1, 5, 6, 9-11 and 18, as amended. In support of this conclusion, the following annotated copy of claims 1, 5, 6, 9-11 and 18, as amended, indicates an association between claim features and drawing identifiers. The identifiers in the annotations are shown in Figures 1, 2A, 2B, 2C, 2D, 4A, 4B, 6A and 6B.

1. (as amended) An electronic display comprising:
 - a display medium comprising at least one capsule [134] containing a plurality of electrophoretic particles [136] dispersed in a fluid medium [138];
 - a transistor having a data line [30'], a gate electrode [53'] and a pixel electrode [34'] and comprising a layer [54'] of insulating material of the transistor situated between a first layer [10', 53'] of conductive material of the transistor that forms the gate electrode [53'] and a second layer [30', 34', 59'] of conductive material of the transistor that forms the data line [30'] and pixel electrode [34'], the transistor for applying an addressing voltage to the display medium via the pixel electrode [34']; and
 - a storage capacitor [92'] comprising a layer [30, 54'] of insulating material of the storage capacitor situated between a first layer [10, 53'] of conductive material of the storage capacitor and a second layer [14, 34', 59'] of conductive material of the storage capacitor [92'], said storage capacitor in electrical communication with the display medium addressed by the transistor for reducing a rate of voltage decay across the display medium.
5. (as amended) The display of claim 4 wherein one of said layers of material of said transistor and a respective one of said layers of material of said storage capacitor are a same continuous layer [54', 56'] of material.
6. (as amended) The display of claim 4 wherein said layer of semiconducting material is unpatterned [56'].
9. (as amended) The display of claim 1 wherein the second layer of conductive material of the storage capacitor forms a storage capacitor pixel electrode [14], and the first layer of conductive material of the storage capacitor forms a storage capacitor gate electrode [10].
10. (as amended) The display of claim 1 wherein the layer [30 in FIG. 2D] of insulating material of the storage capacitor is patterned.
11. (as amended) The display of claim 1 wherein the layer [30 in FIG. 2B] of insulating material of the storage capacitor is unpatterned.
18. (as amended) An electronic display comprising:
 - a display medium comprising at least one capsule [134] containing a plurality of electrophoretic particles [136] dispersed in a fluid medium [138]; and
 - a storage capacitor [92'] comprising a layer [30, 34'] of insulating material situated between a first layer [10, 53'] of conductive material and a second layer [14, 34'] of conductive material, said storage capacitor in electrical communication with a pixel comprising a portion of the display medium for reducing a rate of voltage decay across the pixel.

The amendment of Figure 4B adds dashed boxes to indicate the transistor and the capacitor, as suggested by the Examiner.

For all the above reasons, Applicants respectfully request that the proposed amendment to Figure 4B be accepted, and that the objections to the drawings be reconsidered and withdrawn.

Objections to Claims 1 and 20

Claims 1 and 20 are objected to for informalities. Claim 20 is herein cancelled. As suggested by the Examiner, claim 1 has been amended to change the "transistor pixel electrode" to the "pixel electrode". Therefore, Applicants respectfully request that the objection to claim 1 as being informal be reconsidered and withdrawn.

Rejection of Claims 1-17 Under 35 U.S.C. § 112, Second Paragraph

Claims 1-9 and 11-15 are rejected under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Claims 2, 13 and 14 are herein cancelled.

The amendment to claim 1 clarifies that the layers of the transistor and the layers of the storage capacitor can be different layers. The amendment to claim 3 makes the subject matter recited by claim 3 consistent with the subject matter recited by claim 1, from which it depends. Therefore, Applicants respectfully request that the objection to claims 1, 3-9, 11, 12 and 15 under 35 U.S.C. § 112, second paragraph, be reconsidered and withdrawn.

Rejection of Claims 6, 9-14, 17, 19 and 20 Under 35 U.S.C. § 112, First Paragraph

Claims 6, 9-14, 17, 19 and 20 are rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 13, 14, 17, 19 and 20 have been cancelled.

In view of the amendments to dependent claims 6 and 9-12, and to independent claim 1 from which claims 6 and 9-12 depend, Applicants respectfully submit that claims 6 and 9-12 contain subject matter that is properly described in the specification. Therefore, Applicants respectfully request that the rejection of claims 6 and 9-12 under 35 U.S.C. § 112, first paragraph, be reconsidered and withdrawn.

Rejection of Claims 1, 3-17, 19 and 20 Under 35 U.S.C. § 103(a)

Claims 1, 3-17, 19 and 20 are rejected under 35 U.S.C. § 103(a) as being obvious in view of U.S. Patent No. 5,238,861 to Morin et al. ("Morin"). Claims 13, 14, 17, 19 and 20 are herein cancelled. Applicants respectfully submit that Morin does not teach or suggest the subject matter recited by amended independent claim 1, for the following reasons.

Amended independent claim 1 recites an electronic display that includes, in part, a display medium. The display medium includes at least one capsule containing a plurality of electrophoretic particles dispersed in a fluid medium. In contrast, Morin only teaches active matrix liquid crystal display screens, and does not disclose an electrophoretic display medium. See, e.g., Morin, column 1, lines 13-19.

Further, the liquid crystal display medium described by Morin is confined between two electrodes (see, e.g., Morin, column 1, lines 12-18), but includes no capsules, as recited by amended claim 1. Thus, Morin does not teach or suggest the subject matter recited by claim 1 because Morin does not teach or suggest an electronic display that includes electrophoretic particles or electrophoretic particles in a capsule.

For the above reasons, Applicants respectfully submit that Morin neither teaches or suggests an electronic display having a display medium that includes at least one capsule containing a plurality of electrophoretic particles dispersed in a fluid medium, as recited by amended claim 1. Therefore, amended independent claim 1 is patentable over Morin.

Claims 3-12, 15 and 16 depend directly or indirectly from claim 1. Because claim 1 is patentable over Morin, Applicants submit that claims 3-12, 15 and 16 also are patentable over Morin. Therefore, Applicants respectfully request that the rejection of claims 1, 3-12, 15 and 16 under 35 U.S.C. § 103(a) in view of Morin be reconsidered and withdrawn.

Rejection of Claims 2 and 18 Under 35 U.S.C. § 103(a)

Claims 2 and 18 are rejected under 35 U.S.C. § 103(a) over Morin in view of U.S. Patent No. 6,140,980 to Spitzer et al. ("Spitzer"). Claim 2 is herein cancelled. Applicants respectfully submit that Morin in view of Spitzer does not teach or suggest the subject matter recited by

amended independent claim 18, for either one of two reasons. First, Morin and Spitzer do not disclose at least one capsule, as recited by claim 18. Second, Morin and Spitzer do not provide any motivation to combine an electrophoretic display medium with the display system capacitors taught by Morin and Spitzer.

First, neither Morin nor Spitzer disclose an encapsulated electrophoretic display medium. In contrast, amended independent claim 18 recites an electronic display that includes a display medium and a storage capacitor; the display medium includes at least one capsule, and the at least one capsule contains a plurality of electrophoretic particles dispersed in a fluid medium. For the reasons described above for claim 1, Morin alone does not teach or suggest either an electrophoretic display medium or an encapsulated display medium.

Spitzer alone does not teach or suggest a display medium that includes at least one capsule, where the at least one capsule contains a plurality of electrophoretic particles, as recited by claim 18. The Office action asserts that Spitzer teaches "that the invention can be implemented in LCD, electrophoretic display or other type displays." See Office action, page 11, paragraph 12. Spitzer, however, does not teach or suggest a display that includes at least one capsule containing a plurality of electrophoretic particles.

The combination of Morin and Spitzer also does not teach or suggest at least one capsule containing a plurality of electrophoretic particles because neither reference teaches or suggests at least one capsule containing a plurality of electrophoretic particles. For the above reasons, Applicants respectfully submit that amended claim 18 is patentable over Morin in view of Spitzer.

Second, the combination of Morin and Spitzer provides no motivation to combine an electrophoretic display medium with the display system capacitors taught by either Morin or Spitzer, for the following reasons.

Spitzer is directed to a complex hybrid multi-function circuit on a common module substrate. See, e.g., column 5, lines 10-11. All embodiments of the invention disclosed by Spitzer are directed to the use of a liquid crystal material.

Spitzer includes a single mention of non-liquid crystal materials in a perfunctory catchall list of display materials included in the final paragraph of the specification: “other type displays both active and passive are within the contemplation of the invention; such as, without limitation, the following: active displays, e.g., plasma display panels, electroluminescent displays, vacuum fluorescent displays and light emitting diode displays; passive displays: electrophoretic image displays, suspended particle displays, twisting ball displays or transparent ceramic displays.” See Spitzer, column 30, lines 43-49.

The teachings and suggestions in Spitzer regarding capacitors, however, are specific to liquid crystal material. Spitzer teaches that a “capacitor 56 sustains a charge on the pixel electrode adjacent to the liquid crystal material...until the next scan of the pixel array 25. Note that the various embodiments of the invention may, or may not, utilize capacitors 56 with each pixel depending upon the type of display desired.” See, e.g., Spitzer, column 6, lines 13-18 (emphasis added). Thus, Spitzer suggests that the capacitor 56 may be desirable in conjunction with a liquid crystal material, but may not be desirable for other display materials.

Moreover, one of ordinary skill in the art would not be motivated by Spitzer and Morin to substitute an electrophoretic display medium in a display embodiment that includes a capacitor. Spitzer and Morin teach that the capacitors serve a purpose that is not relevant to an electrophoretic material-based display. Spitzer and Morin teach capacitors that provide the sustained voltage required to maintain a particular optical state of a liquid crystal material. Electrophoretic materials, however, do not require application of a voltage to maintain a particular optical state.

A voltage applied to the liquid crystal material must be maintained to maintain the optical state induced by the presence of the voltage. A capacitor, according to Morin and Spitzer, maintains the optical state of the liquid crystal material by maintaining a voltage at an addressing voltage level.

In contrast, electrophoretic material-based pixels can maintain their optical state without application of a voltage. Thus, the disclosures of Spitzer and Morin suggest that the capacitor in

the liquid crystal material-based display embodiments would have no role in an electrophoretic medium-based display.

Moreover, electrophoretic display media have slower switching speeds than liquid crystal media. A storage capacitor in support of an electrophoretic display medium, as recited in claim 18, provides faster scanning of the display by permitting the use of a relatively brief driving pulse sufficient to charge the storage capacitor. The charged capacitor then provides a voltage to complete the transition of the optical state of the electrophoretic display medium. The capacitor, however, does not maintain the optical state of the electrophoretic display medium.

Thus, there is no motivation for one of ordinary skill in the art to combine the capacitor of Morin or Spitzer with an electrophoretic display medium. Accordingly, Applicants submit that one of ordinary skill in the art, fully aware of the teachings of Morin and Spitzer, would have no motivation to provide a storage capacitor in electrical communication with a pixel including a portion of an electrophoretic display medium, as recited by claim 18.

For the above reasons, Applicants respectfully submit that Morin and Spitzer, each alone or in combination, do not teach or suggest a storage capacitor and at least one capsule containing a plurality of electrophoretic particles, as recited by amended claim 18. Therefore, amended independent claim 18 is patentable over Morin and Spitzer. Therefore, Applicants respectfully request that the rejection of claim 18 under 35 U.S.C. § 103(a) over Morin in view of Spitzer be reconsidered and withdrawn.

Applicants note that claim 1 is herein amended to incorporate limitations of original claim 2, now cancelled. For all the reasons described above for amended claim 18, Applicants respectfully submit that amended claim 1 is patentable over Morin in view of Spitzer.

CONCLUSION

In view of the amendments and arguments presented herein, Applicants respectfully request that the rejection of claims 1, 3-12, 15, 16 and 18, as amended, be reconsidered and withdrawn, with claims 1, 3-12, 15, 16 and 18 proceeding to issue. The Examiner is invited to

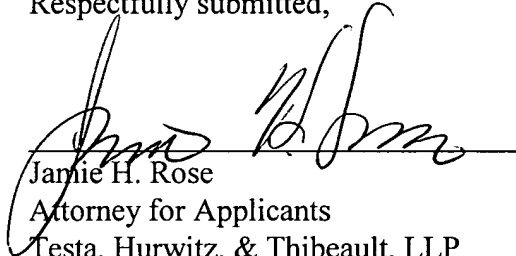
call the undersigned, if the Examiner believes that a telephone conversation could be helpful in expediting prosecution of the instant application.

Respectfully submitted,

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Reg. No. 45,054

Tel. No.: (617) 248-7376
Fax No.: (617) 248-7100

2521209


Jamie H. Rose
Attorney for Applicants
Testa, Hurwitz, & Thibault, LLP
High Street Tower
125 High Street
Boston, Massachusetts 02110

Marked Up Version of the Amended Claims

1. (Amended) An electronic display comprising:
 - a ~~[an encapsulated]~~ display medium comprising at least one capsule containing a plurality of electrophoretic particles dispersed in a fluid medium ~~[a plurality of pixels]~~;
 - a transistor having a data line ~~[electrode]~~, a gate electrode and a pixel electrode and comprising a layer of insulating material of the transistor situated between a first layer of conductive material of the transistor that forms the gate electrode and a second layer of conductive material of the transistor that forms the data line and pixel electrode[s], the transistor for applying an addressing voltage to the display medium ~~[one of the pixels]~~ via the pixel electrode; and
 - a storage capacitor comprising a layer of insulating material of the storage capacitor situated between a first layer of conductive material of the storage capacitor and a second layer of conductive material of the storage capacitor, said storage capacitor in electrical communication with the ~~[pixel]~~ display medium addressed by the transistor for reducing a rate of voltage decay across the ~~[pixel]~~ display medium.
2. (Canceled)
3. (Amended) The display of claim 1 wherein one of said layers of material ~~[comprising]~~ of said transistor and a respective one of said layers of material ~~[comprising]~~ of said storage capacitor ~~[comprise]~~ are a same continuous layer of material.
5. (Amended) The display of claim 4 wherein one of said layers of material ~~[comprising]~~ of said transistor and a respective one of said layers of material ~~[comprising]~~ of said storage capacitor ~~[comprise]~~ are a same continuous layer of material.
6. (Amended) The display of claim 4 wherein ~~[said transistor and]~~ said layer of semiconducting material is unpatterned ~~[storage capacitor comprise a plurality of continuous layers of material]~~.

7. (Amended) The display of claim 1 wherein the storage capacitor is in electrical communication with a second gate line different from a first gate line in electrical communication with the ~~[transistor]~~ gate electrode for addressing the display medium [pixel].
9. (Amended) The display of claim 1 wherein the second layer of conductive material of the storage capacitor forms [comprises] a storage capacitor pixel electrode, [an insulator disposed adjacent the pixel electrode] and the first layer of conductive material of the storage capacitor forms a storage capacitor gate electrode [disposed adjacent the insulator].
10. (Amended) The display of claim 1 [9] wherein the layer of insulating material of the storage capacitor [insulator] is patterned.
11. (Amended) The display of claim 1 [9] wherein the layer of insulating material of the storage capacitor [insulator] is unpatterned.
12. (Amended) The display of claim 1 [9] wherein the layer of insulating material of the storage capacitor and the layer of insulating material of the transistor are a same layer [insulator forms a part of the storage capacitor and the transistor].
13. (Cancelled)
14. (Cancelled)
15. (Amended) The display of claim 1 wherein a capacitance of the storage capacitor is greater than a capacitance of ~~[the]~~ a pixel comprising a portion of the display medium.
16. (Amended) The display of claim 1 wherein a voltage decay time across ~~[the]~~ a pixel comprising a portion of the display medium is based on the product of R_p and $(C_p + C_s)$ where R_p is a resistance of the pixel, C_p is a capacitance of the pixel, and C_s is a capacitance of the storage capacitor.
17. (Cancelled)

18. (Amended) An electronic display comprising:

a ~~[an encapsulated electrophoretic]~~ display medium comprising at least one capsule containing a plurality of electrophoretic particles dispersed in a fluid medium [a plurality of pixels]; and

a storage capacitor comprising a layer of insulating material situated between a first layer of conductive material and a second layer of conductive material, said storage capacitor in electrical communication with a pixel comprising a portion of the display medium [one of said plurality of pixels] for reducing a rate of voltage decay across the pixel.

19. (Canceled)

20. (Canceled)